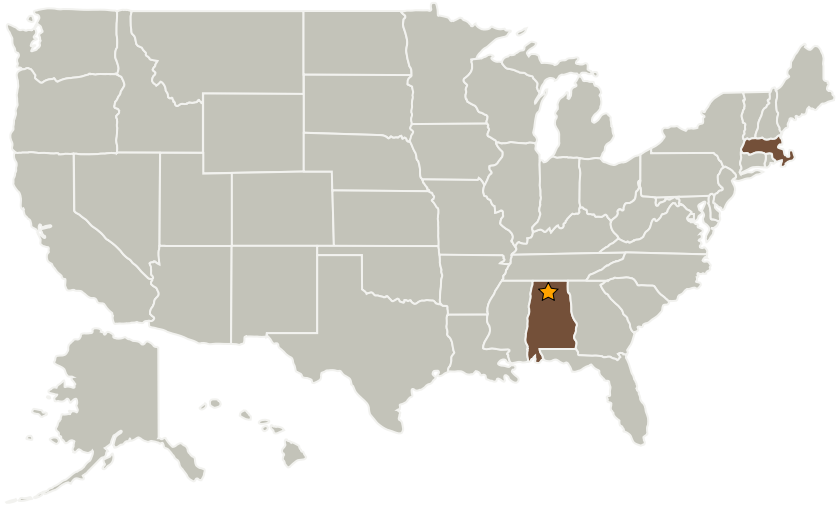
Aerogel Enhanced TPS Concepts for Aerocapture, Phase I

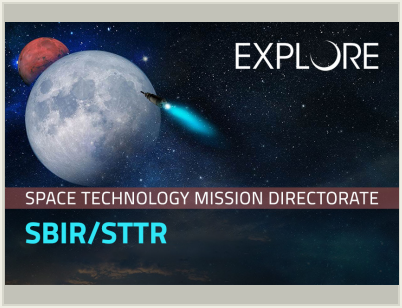
Completed Technology Project (2004 - 2004)

Project Introduction

NASA?s In-Flight Propulsion Program is investigating aerocapture as a rapid, highly efficient method for insertion of probes into long-duration scientific orbits. Aerocapture, an aggressive braking maneuver intended to achieve a scientific orbit directly (?capture?) from a hyperbolic approach trajectory, places extremely high peak heat loads of short duration on the leading surfaces of the spacecraft. Flexible silica aerogel composites, a class of super-insulation material recently developed by Aspen Aerogels, has not been utilized before in high temperature TPS designs. Thermophysical characterization data will be collected during the Phase I program for high-temperature durable, flexible aerogel composites at different densities, pressures and temperatures. The test data will be used to run detailed thermal performance simulations for the Titan aerocapture mission using TPS designs incorporating the best performing material. During the Phase I program, an aerogel augmented TPS lay-up using the best performing materials will be sized to maintain the aeroshell bondline temperature below 250 ?C for the duration of the Titan aerocapture maneuver. The aerogel TPS design is likely to save over 60 kg of parasitic forebody TPS weight for the Titan Orbiter aeroshell compared to the most promising non-aerogel alternative (TUFROC).

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Aspen Aerogels, Inc.	Supporting Organization	Industry	Northborough, Massachusetts

Primary U.S. Work Locations	
Alabama	Massachusetts

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

George Gould

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.3 Thermal Protection Components and Systems
    - TX14.3.1 Thermal Protection Materials